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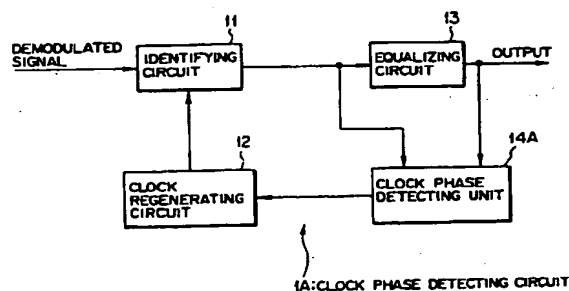
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(54) Clock phase detecting circuit and clock regenerating circuit each arranged in receiving unit of multiplex radio equipment

(57) The present invention relates to a clock phase detecting circuit and a clock regenerating circuit each arranged in a receiving unit of multiplex radio equipment. The receiving unit of the multiplex radio equipment includes an identifying circuit (11) for identifying a signal obtained by demodulating a multilevel orthogonal modulated signal; a clock regenerating circuit (12) for regenerating a signal identification clock for the identifying circuit (11) to supply the clock to the identifying circuit (11); an equalizing circuit (13) for subjecting the demodulated signal to an equalizing process (13). A clock phase detecting unit (14A) detects the phase component of the signal identification clock based on signals input to or output from the equalizing circuit (13) and then supplies the phase component to the clock regenerating circuit (11). The phase component of a signal identification clock can be certainly detected and accurately adjusted so that the signal identification clock can be regenerated with high accuracy.

FIG. 1



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EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP 0 368 307 A (NIPPON ELECTRIC CO) 16 May 1990 * page 1, line 47 - line 55 * * page 4, line 54 - page 5, line 32 * * page 6, line 38 - line 48 * A * page 6, line 53 - page 7, line 16 * * page 8, line 41 - line 53; figure 1 *	1,10-13, 15,17, 18,20 2,3,6, 14,19	H04L7/02 H04L7/033 H04L27/38
X	DE 31 24 329 A (AEG TELEFUNKEN NACHRICHTEN) 28 April 1983 Y * the whole document *	1,10,11 12,13,17 3,7,8	
Y	EP 0 249 931 A (FUJITSU LTD) 23 December 1987 A * page 5, line 1 - line 22 * * page 6, line 24 - page 9, line 23 *	12,13,17	
X	US 4 012 591 A (SAILER HEINRICH ET AL) 15 March 1977 * column 2, line 31 - line 55 * * column 3, line 61 - column 4, line 7 * A * column 4, line 37 - line 63 * * figures 1-5 *	1,10,11, 17 2-4,7	TECHNICAL FIELDS SEARCHED (Int.Cl.6) H04L
X	SAILER H: "TIMING RECOVERY IN DATA TRANSMISSION SYSTEMS USING MULTILEVEL PARTIAL RESPONSE SIGNALING" INTERNATIONAL CONFERENCE ON COMMUNICATIONS CONFERENCE RECORD ICC '92. 14-18 JUNE 1992, CHICAGO, IL, US, vol. 2, 16 June 1975, pages 24-27, XP000579359 A * page 24, right-hand column, line 48 - page 25, left-hand column, line 58; figure 1 *	1,10,11, 17 2-4,7	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29 June 1999	Examiner Pieper, T
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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Application Number
EP 95 11 8303

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	"OFFSET BINARY SIMPLIFIES TIMING CONTROL IN A PRIV COMMUNICATION CHANNEL" IBM TECHNICAL DISCLOSURE BULLETIN, vol. 33, no. 12, 1 May 1991, pages 5-8, XP000121439 * page 5, paragraph 1 - page 6, paragraph 2 * * figure 1 *	1,10,17	
A	EP 0 173 298 A (NIPPON ELECTRIC CO) 5 March 1986 * page 3, line 1 - page 5, line 14 * * page 8, line 7 - page 12, line 13 * * page 13, line 14 - page 18, line 2 * * figures 1-4 *	24,25, 27-38	
A	EP 0 184 805 A (NIPPON ELECTRIC CO) 18 June 1986 * page 7, line 24 - page 16, line 13 * * figures 2A-10 *	24,25, 28-33, 35-40	
A	US 5 255 289 A (TOMITA HIDEHO) 19 October 1993 * column 2, line 5 - column 3, line 34 * * figure 1 *	24,25, 28,29,35	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
Place of search THE HAGUE		Date of completion of the search 29 June 1999	Examiner Pieper, T
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



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**LACK OF UNITY OF INVENTION
SHEET B**

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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims: 1 - 23

Clock phase detection based on input/output signals of equalizing circuit

2. Claims: 24 - 41

Clock phase detection based on clock phase difference information and signal error differential information.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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29-06-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0368307 A	16-05-1990	JP 1954137 C	28-07-1995
		JP 2131031 A	18-05-1990
		JP 6087540 B	02-11-1994
		AU 615864 B	10-10-1991
		AU 4452289 A	17-05-1990
		CA 2002585 A,C	10-05-1990
		DE 68926653 D	18-07-1996
		DE 68926653 T	13-02-1997
		US 4975927 A	04-12-1990
DE 3124329 A	28-04-1983	NONE	
EP 0249931 A	23-12-1987	JP 1734267 C	17-02-1993
		JP 4023459 B	22-04-1992
		JP 62298255 A	25-12-1987
		CA 1261928 A	26-09-1989
		DE 3787217 D	07-10-1993
		DE 3787217 T	03-02-1994
		US 4788696 A	29-11-1988
US 4012591 A	15-03-1977	DE 2331601 B	16-01-1975
		AT 338878 B	26-09-1977
		AT 379374 A	15-01-1977
		BE 816630 A	20-12-1974
		CH 571294 A	31-12-1975
		DK 328974 A,B,	17-03-1975
		FI 158374 A,B,	21-12-1974
		FR 2234723 A	17-01-1975
		GB 1457309 A	01-12-1976
		NL 7408148 A	24-12-1974
		SE 388332 B	27-09-1976
		SE 7407750 A	23-12-1974
EP 0173298 A	05-03-1986	JP 1744027 C	25-03-1993
		JP 4028185 B	13-05-1992
		JP 61056555 A	22-03-1986
		AU 574975 B	14-07-1988
		AU 4664185 A	06-03-1986
		CA 1240001 A	02-08-1988
		US 4620159 A	28-10-1986
EP 0184805 A	18-06-1986	JP 1735363 C	17-02-1993
		JP 4020545 B	03-04-1992
		JP 61137446 A	25-06-1986
		AU 573713 B	16-06-1988
		AU 5085585 A	19-06-1986

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 95 11 8303

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

29-06-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0184805 A		CA 1276693 A	20-11-1990
		CN 1003399 B	22-02-1989
		US 4631488 A	23-12-1986

US 5255289 A	19-10-1993	JP 6132994 A	13-05-1994

EPO FORM P0459

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